UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AUG 29 1980

Docket Nos. 50-416
and 50-417

Mr. J. P. McGaughy
Assistant Vice President -
Nuclear Production
Mississippi Power and Light Company
P. O. Box 1640
Jackson, Mississippi 39205

Dear Mr. McGaughy:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION - GRAND GULF NUCLEAR STATION, UNITS 1 AND 2

As a result of our review of the information contained in the Final Safety Analysis Report for the Grand Gulf Nuclear Station, Units 1 and 2, we have developed the enclosed request for additional information. Included are questions from the Structural Engineering Branch and the Core Performance Branch.

We request that you amend your Final Safety Analysis Report to reflect your responses to the enclosed requests as soon as possible and to inform the Project Manager, Joseph A. Martore, of the date by which you intend to respond.

Sincerely,

R. L. Tedesco

Robert L. Tedesco, Assistant Director
for Licensing
Division of Licensing

Enclosure:
Request for Additional
Information

cc w/enclosure:
See next page

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ENCLOSURE

SECOND ROUND QUESTIONS - GRAND GULF
REACTOR PHYSICS SECTION
CORE PERFORMANCE BRANCH

232.7 (Figures 4.3-26 15.0-2 15.0-3)	By combining Figures 15.0-3 and 4.3-26 to obtain a curve of scram reactivity insertion as a function of time, it is possible to show that the scram curve used in safety analyses is conservative with respect to the anticipated Grand Gulf Scram curve (multiplied by 0.8). Please confirm this conclusion.
232.8 (Section 4.3.2.5)	The text in Section 4.3.2.5.5 states that Figure 4.3-26 has three curves instead of the two that it has. Please revise the figure to conform to the text.
232.9 (Section 4.3.2.5)	Reference 11, cited in Section 4.3.2.5.5, does not appear to address the neutronics aspects of the one dimensional code used to obtain the scram curve. Further, the LOCA context in which the thermal hydraulics model is described is unsuitable for pressure increase transients, for example. Please provide a suitable reference.
232.10 (Table 15.4-11)	Comparison of the rod worth values in this table to those for a similarly located rod in Table 4.3 of NEDO-21231 shows that the Grand Gulf values are lower than the generic values This is presumably due to the assumption of different loading patterns for the two cases. Please clarify and present a qualitative explanation for the differences.
232.11 (Table 15.4-11)	In the generic analysis (NEDO-21231) the most reactive rod in the withdrawal sequence was a group nine rod withdrawal after the withdrawal of groups 5 and 6 (the peripheral groups). Presumably hot shutdown criticality could occur sometime during the cycle at these conditions. Why was not the highest rod worth attained under these conditions in Grand Gulf?
232.12 (Table 15.0-2)	The units on the Doppler coefficient value are not complete. Please provide amended values.

MISSISSIPPI POWER AND LIGHT COMPANY

GRAND GULF NUCLEAR STATION, UNITS 1 AND 2

DOCKET NUMBERS 50-416/417

STRUCTURAL ENGINEERING BRANCH

SECOND REQUEST FOR INFORMATION

130.13 (3.5) (RSP) You indicated that the potection of equipment and structures against tornado generated missiles is based on the thickness of roofs and walls in excess of 24 inches and tests conducted by the Calspan Corp. While these test may be representative for some of the missiles they do not represent the entire spectrum of missiles considered in the FSAR. Furthermore, they can not be considered as acceptable for protection against overall structural response. In view of the above you are requested to assess the degree of damage due to tornado generated missiles using the methods acceptable to the NRC Staff such as those described in the SRP Section 3.5.3 or "Design of Strutures for Missile Impact" BC-TOP9A, Revision 2, Bechtel Power Corp. 1974.

130.14 (3.7.1) (RSP) It is noted that the amplification factors in Table 3.7-16 of the FSAR are different from those contained in the Regulatory Guide (RG) 1.60. It is also noted that the response spectra for the Grand Gulf are lower than those resulting from the Regulatory Guide (Fig. 3.7-64, 3.7-65, 3.7-66 etc.). Furthermore, the FSAR does not describe clearly how and which amplification factors have been used in the plant design. Since the Regulatory Guide 1.60 is the standard acceptable to the staff for obtaining response

spectra, explain and justify the spectra used for design of the plant, and demonstrate that the degree of conservatism resulting thereof is comparable to that which would be obtained if the R.G. 1.60 were fully implemented or indicate your willingness to comply with the R.G. 1.60.

130.15 (3.7.1) Explain if the last statement in section 3.7.1.12 relating horizontal and vertical seismic motion is applicable to both SSE and OBE or OBE only.

130.16 (3.7.1) Describe the modifications which have been made to the 1940 El Centro earthquake as appropriate for the Grand Gulf site.

130.17 (3.7.1) Figures 3.7-8, 3.7-13, and 3.7-14 referred to by Request 130.03 have more than five points falling below the design response spectrum. Standard Review Plan (SRP) 3.7.1 requires that "no more than five points of the spectra obtained from the time history should fall below, . . ., the design response spectra." Justify this apparent deviation from the SRP, assess its impact on the conservatism of the design and provide the basis for its acceptance by the staff.

130.18 (3.7.2) Section 3.7.2 of the FSAR does not clearly specify which of the Category I Structures have been analyzed using a two-dimensional model and which have been analyzed using a three-dimensional model. Please clarify. Also, indicate clearly how the individual components have been combined to obtain the total structural response to be used in the load combination equations described in section 3.8.

130.19 (3.7.2) With reference to FSAR Section 3.7.2.11 specify the criteria used to decide which ratio of uncoupled torsional frequency to the uncoupled lateral frequency had a negligible effect and when the structure was considered to be symmetrical.

130.20 (3.7.3) With reference to the FSAR Section 3.7.3.4, discuss the criteria used in selection of fundamental frequencies and compare these criteria to those contained in the SRP Section 3.7.3.II.4. It is the position of the Regulatory staff that to avoid resonance, the fundamental frequencies of components and equipment should be selected to be less than half or more than twice the dominant frequencies of the supporting structures.

130.21 (3.7.3) Provide more information regarding analysis of buried Seismic Category I Piping Systems and Tunnels. The methods of analysis acceptable to the NRC Staff are described in the SRP Section 3.7.3, References 1 and 2.

130.22 (3.7) Review of the FSAR reveals that the seismic analysis which was used for the Grand Gulf plant is in accordance with Bechtel Topical Report BC-TOP4 Rev. 1, dated September 1972. The approved

version of this report is Revision 3A, dated November 1974. The staff identified some significant deviations from the approved version, e.g., damping values for structures and amplification factors. You are requested to assess the impact of use of the Revision 1 of the BC-TOP4 report and provide sufficient information to enable the reviewers to determine the degree of conservatism inherent in the design of the plant resulting from its use.

130.23 (3.7.3) Justify the use of 15% for a critical damping value for SSE for bolted steel cable tray supports in Table 3.7-3. Also explain why are the N/A entries included for the OBE for two of the entries in Table 3.7-3.

130.24 (3.7.2) With respect to FSAR Section 3.7.2.1.1.3.5, explain and give an example as to what is meant by using "a more conservative SRSS approach using member forces and moments" for structural design of the building.

130.25 (3.7.2) (RSP) Your description of the finite element analysis for the deeply embedded structures, Section 3.7.2.4, implies free or transmitting boundaries in horizontal directions in case of a horizontal input motion and in vertical direction in case of a vertical input motion. The NRC Staff requires that the response calcuations should be compared with a half spaced lumped spring approach for a representative structure. The current position of the NRC Staff regarding this subject is contained in the Enclosure 1. Also, assess the impact of such a deviation from the staff's position on analysis with regard to behavior of this structure during a seismic event.

130.26 (3.7.3) With respect to FSAR, Section 3.7.3.1, explain how the initially computed floor response spectra are smoothed for frequencies associated with the structural frequencies. Demonstrate the conservativeness of the method used.

130.27 (3.7.2) With respect to Section 3.7.2.1.2.5.2, you stated that for equipment supported at more than two points, the response spectrum at the elevation near the center of gravity of the equipment is chosen. Section 3.7.3.11.9 of the SRP states that an acceptable approach is to use an upper bound envelope of all the individual response spectra at the support points and use these spectra as input to the equipment. Justify the approach used in your analysis and assess its conservatism as compared with the requirements of the SRP. Also provide more detail and give an example of how the relative displacement between supports are generated and used in the static analysis of systems with differential support motion.

130.28 (3.7.4) (RSP) The seismic instrumentation described in Section 3.7.4 of the FSAR is not acceptable . Full compliance with the requirements of the SRP, Section 3.7.4, is requested.

130.29 (3.8.1) The criteria contained in the ACI-318-71 Code used as the leading document for design of containment are not acceptable.

The acceptable criteria for design of concrete containment are those contained in the Article CC-3000 of the

of the ACI-359 Code with the exceptions specified in the Standard Review Plan, (SRP), Section 3.8.1.II. Examination of the FSAR shows that there are several important deviations from the SRP, e.g., load factors used in load combination equations in Normal Operating and Severe Environmental Conditions are unity for the dead load and live load although the method of analysis used was the ultimate strength design of ACI-318-71. In order to enable the staff to evaluate compatibility between the two sets of criteria, compare the criteria used in the design of the containment with those contained in the ACI-359 and the SRP in sufficient detail to establish conservativeness of the design of the containment.

130.30 (3.8.1) Relate the allowable stresses for the liner plate contained in Table 3.8-4 and 3.8-5 to those contained in ASME Boiler and Pressure Vessel Code, Section III, Division 2, Subarticle CC-3700.

130.31 (3.8.1) Explain the statement in Section 3.8.1.4.1.1.1 of the FSAR that although ASHSD program is capable to analyze a structure for non-axisymmetrical dynamic loading "for SSE, OBE and non-axisymmetrical pool swell bubble pressure an isotropic, elastic linear analysis was performed for static non-axisymmetrical loads." What modifications or changes have been made to reduce the dynamic loads such as these to the equivalent static loads?

130. 32 (3.8.1) (RSP) With regard to Section 3.8.1.7, Testing and in Service Surveillance Requirements, indicate the following:

a) Is the containment structure for Grand Gulf considered as a prototype as specified in the Appendix to the Regulatory Guide 1.18 and if so, is it to be instrumented and tested accordingly?

b) The present position of the NRC Staff regarding the requirements for testing is expressed in the proposed Regulatory Guide 1.136, dated November 1979 which endorses, with some exceptions, Article CC-6000 of the ASME Boiler and Pressure Vessel Code Section III, Division 2, (ACI-359). Indicate your compliance with its provisions.

130.33 (3.8.3) (RSP) With reference to Section 3.8.3.2.2.1, Design Codes, it is the NRC Staff position that the ACI-349-76 Code should be used in conjunction with the Regulatory Guide 1.142. Compare the conservatism of the design inherent in the design of the plant with that which would result by adopting the above staff position.

130.34 (3.8.3) Explain the meaning of the statement in the first sentence of Section 3.8.3.5.1. In your response address the fact that the ASME Code, Section III, Division 1 is directed to a homogenous material (steel) where as the ACI-318-71 is addressed to the heterogeneous material (steel and concrete).

130.35 (3.8.3) With reference to Section 3.8.3.5.2 through 3.8.3.5.5, you stated that the members are designed in accordance with strength requirements of ACI-318-71. The principal method of design according to ACI-318-71 is the strength design which determines the capacity of the section. On the other hand, you refer to the allowable and

actual stresses in Tables 3.8-13 through 3.8-25 indicating that the design was performed using working stress method. Furthermore, Section 3.8.6, Structural Design Criteria for Seismic Category I Structures Other Than Containment, contains load combination equations with factored loads, suggesting that the strength design method was used in the design. Clarify the apparent discrepancy.

130.36 (3.8.3) With reference to Section 3.8.3.5.5.3 of the FSAR, Steel Structures, some deviations from the requirements of the SRP Section 3.8.3.II.3 have been noted. For example, for the load combination including the OBE the allowable stress for structural steel F_s is increased by 25%. Justify this increase.

Provide sufficient information so that the reviewer can assess the margins of safety in the design of the steel structures of the Grand Gulf plant as compared to those which would result if the criteria contained in the SRP were used.

130.37 (3.8.3) (RSP) With reference to Section 3.8.3.7 of the FSAR, the tolerance band of predicted deflections appears to be excessive. The tolerance band acceptable to the NRC staff is contained in the current ASME Boiler and Pressure Vessel Code, Section III, Division 2, Article CC-6000. Indicate your willingness to comply with this position. Also, although certain test requirements outlined in the FSAR are acceptable to the staff, there are some provisions in the description of testing which differ from

the technical position of the staff. The technical staff position on Testing and In Service Surveillance Requirements for BWR Mark III Containment Drywell is attached (Enclosure 2). You are requested to revise the proposed test procedure described in the FSAR to comply with the enclosed test requirements.

130.38 (3.8.4) With reference to FSAR Section 3.8.3.1 diesel fuel storage tanks which are classified as Category I in Section 3.2 (Sh. 8 of 23) should be listed with other Seismic Category I structures. Specify if these tanks have been designed using Category I criteria or not.

130.39 (3.8.4) With reference to FSAR Section 3.8.4.1.1.7 provide additional information regarding the release mechanism of the siding to ascertain that the building will be stripped of its siding at the appropriate pressure. Also, demonstrate that the structural steel framing is capable to withstand a tornado wind and missiles without collapse or generating new missiles during a tornado.

130.40 (3.8.6) With respect to FSAR Sections 3.8.6.2 and 3.8.6.3 it appears that the load combination equations contained therein deviate from those which are in the Standard Review Plan Section 3.8.3.4.II.3.a, and 3.b. In this connection:

a) demonstrate that the load combination equations listed in the referenced sections of the FSAR envelope all the loading situations of the SRP.

b) Identify and justify any deviations from the load combination equations contained in the SRP.

c) Compare the conservatism resulting from use of your load combination equations with that which would result if the SRP criteria were fully implemented.

130.41 (3.8.4) Your statement in FSAR Section 3.8.4.4.3 regarding steel requirements for electrical ductbanks implies that the reinforcement provided is in accordance with some criteria other than as requried by the analysis for the Category I structures. Please explain what criteria have been used in the design of the electrical ductbanks.

130.42 (3.8.5) With reference to Section 3.8.5.4.2, justify the increase of the maximum allowable bearing pressure by 50 percent for dynamic loads.

ENCLOSURE 1.

SUMMARY OF SEB INTERIM LICENSING
POSITIONS AND STATUS OF SRP REVISION
MARCH 1979

SRP SECTION	INTERIM LICENSING POSITION IN ADDITION TO OR DIFF. FROM THOSE LISTED IN CORRESPONDING SRP SECTIONS
3.7.1 Seismic Input	1. Use of site dependent input design spectra is acceptable if the input spectra are reviewed and accepted by GSB (Ref. SRP Section 2.5) 2. For western United States (West of Rockies), the response spectrum for vertical motion can be taken as 2/3 the response spectrum for horizontal motion over the entire range of frequencies. (Encl. 4) 3. Methods for implementing the soil-structure interaction analysis should include both the half space lumped spring and mass representation and the finite element approaches. Category I structures, systems and components should be designed to responses obtained by any one of the following methods: a) Envelope of results of the two methods, b) Results of one method with conservative design consideration of impact from use of the other method, c) Combination of (a) and (b) with provision of adequate conservatism in design. 4. Consideration of the effects due to accidental torsional forces in design (as a minimum, the 5% times base dimension off-setting criteria should apply).

ENCLOSURE 2

7/11/75

Testing and In-service Surveillance Requirements for BWR Mark III Containment Drywell

Each BWR Mark III containment drywell should be subjected to a structural proof test. Such a test is acceptable if in accordance with the following:

a. The drywell should be subjected to an acceptance test that increases the drywell internal pressure in three or more approximately equal pressure increments from atmospheric pressure to at least the design pressure. The drywell should be depressurized in the same number of increments. Measurements should be recorded at atmospheric pressure and at each pressure level of the pressurization and depressurization cycles. At each level, the pressure should be held constant for at least one hour before the deflections and strains are recorded.

b. In prototype drywells only, and so that the overall deflection pattern can be determined, radial deflections should be measured at least at three points along each of at least three meridians equally spaced around the drywell, including locations with varying stiffness characteristics. Radial deflections should be measured at the lower vent region, at about mid-height and at near the top of the cylindrical wall. The measurement points may be relocated depending on the distribution of stresses and deformations anticipated in each particular design.

c. In prototype drywells only, strain measurements sufficient to permit an evaluation of strain distribution should be recorded at least at two opposing meridians at the following locations on the wall:

   (1) at the bottom of the wall, and

   (2) at mid-height of the wall.

   These strain measurements should be made at least at three positions within the wall section; one at the center and one each near the inner and outer surfaces.

d. In nonprototype drywells, deflection and strain measurements need not be made if strain levels have been correlated with deflection measurements during the acceptance test of a prototype drywell, and if measured strains and deflections are within the predefined tolerances on their predicted response.

e. Any reliable system of displacement meters, optical devices, strain gauges, or other suitable apparatus may be used for the measurements.

f. If the test pressure drops due to unexpected conditions to or below the next lower pressure level, the entire test sequence should be repeated. Significant deviations from the previous test should be recorded and evaluated.

g. If any significant modifications or repairs are made to the drywell following and because of the initial test, the test should be repeated.

h. A description of the proposed acceptance test and instrumentation requirements should be included in the preliminary safety analysis report or in its amendments.

j. The following information should be submitted prior to the performance of the test:

(i) The numerical values of the predicted responses of the structure which will be measured.

(ii) The tolerances to be permitted on the predicted responses.

(iii) The bases on which the predicted responses and the tolerances thereon were established.

k. The following information should be included in the final test report:

(i) A description of the actual test and its instrumentation.

(ii) A comparison of the test measurements with the allowable limits (predicted response plus tolerance) for deflections and strains.

(iii) An evaluation of the accuracy of the measurements.

(iv) An evaluation of any deviations (i.e., test results that exceed the allowable limits), the disposition of the deviations, and the need for corrective measures.

(v) A discussion of the calculated safety margin provided by the structure as deduced from the test results.